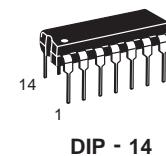


## Description

The LM339 consists of four independent voltage comparators. These were designed specifically to operate from a single power supply over a wide range of voltages. Operation from split power supplies is also possible and the low power supply current drain is independent of the magnitude of the power supply voltage. The outputs can be connected to other open -collector outputs to achieve wired -AND relationships.

## Features

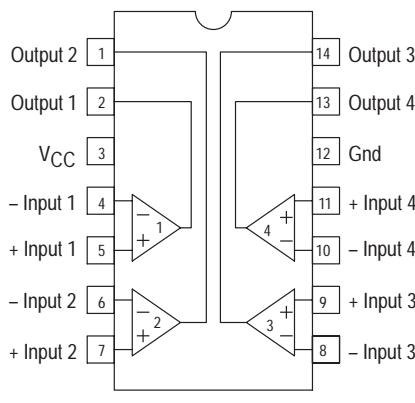
- Wide supply voltage range
- Low supply current drain independent of supply voltage.
- Low input biasing current
- Low input offset current
- Low input offset voltage
- Input common-mode voltage range includes GND
- Differential input voltage range equal to the power supply voltage
- Low output saturation voltage
- Output voltage compatible with TTL, MOS and CMOS logic



## Package

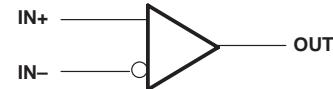
## Internal Block Diagram

### PIN CONNECTIONS



(Top View)

### symbol (each comparator)



## Absolute Maximum Ratings

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Power Supply Voltages Single Supply Split Supplies	36 ±18	V
V <sub>IDR</sub>	Input Differential Voltage Range	36	V
V <sub>ICR</sub>	Input Common Mode Voltage Range (1)	-0.3 to V <sub>CC</sub>	V
t <sub>s</sub>	Short-Circuit duration of Output	100	ms
	Input Current, per pin (2)	50	mA
T	Junction Temperature Plastic Package	150	°C
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	Lead Temperature, 1mm from Case for 10 Seconds	260	°C
P <sub>D</sub>	Power Dissipation T <sub>A</sub> =+25 °C Plastic Package Derate Above 25 °C	1.0 8.0	W mW/ °C

\*Maximum Ratings are those values beyond which damage to the device may occur.

Functional operation should be restricted to the Recommended Operating Conditions.

Notes:

1. Split Power Supplies.
2. V<sub>IN</sub> <-0.3V.

## Switching Characteristics

V<sub>CC</sub>=5V, T<sub>A</sub>=25°C

PARAMETER	TEST CONDITIONS		MIN	TYP	MAX	UNIT
Response time	R <sub>L</sub> connected to 5V through 5.1kΩ, C <sub>L</sub> =15pF (See Note )	100-mV input step with 5 -mV overdrive		1.3		μs
		TTL-level input step		0.3		

□C<sub>L</sub> includes probe and jig capacitance.

NOTE : The response time specified is the interval between the input step function and the instant when the output crosses 1.4V.

## Electrical Characteristics

at specified free -air temperature,  $V_{CC} = 5V$  (unless otherwise noted)

PARAMETER	TEST CONDITIONS*	MIN		TYP	MAX	UNIT
V <sub>IO</sub> Input offset voltage	V <sub>CC</sub> =5V to 30V	25°C		2	5	mV
	V <sub>IC</sub> = V <sub>I</sub> CR <sub>min</sub> V <sub>O</sub> = 1.4V	Full range			9	
I <sub>IO</sub> Input offset current	V <sub>O</sub> = 1.4V	25°C		5	50	nA
		Full range			150	
I <sub>IB</sub> Input bias current	V <sub>O</sub> = 1.4V	25°C		-25	-250	nA
		Full range			-400	
V <sub>ICR</sub> Common -mode input voltage range		25°C	0 to V <sub>CC</sub> -1.5			V
		Full range	0 to V <sub>CC</sub> -2			
AVD Large -signal differential voltage amplification	V <sub>CC</sub> =15V, V <sub>O</sub> =1.4V to 11.4V, R <sub>L</sub> ≥ 15kΩ to V <sub>CC</sub>	25°C	50	200		V/mV
I <sub>OH</sub> High -level output current	V <sub>OH</sub> =5V, V <sub>ID</sub> =1V	25°C		0.1	50	nA
	V <sub>OH</sub> =30V, V <sub>ID</sub> =1V	Full range			1	μA
V <sub>OL</sub> Low-level output voltage	I <sub>OL</sub> =4mA, V <sub>ID</sub> = -1V	25°C		150	400	mV
		Full range			700	
I <sub>OL</sub> Low-level output current	V <sub>OL</sub> =1.5V, V <sub>ID</sub> = -1V	25°C	6			mA
I <sub>CC</sub> Supply current	R <sub>L</sub> = ∞	V <sub>CC</sub> =5V	25°C		0.8	mA
		V <sub>CC</sub> =30V	Full range		2.5	

\*Full range (MIN to MAX), for the LM339 is 0°C to 70 °C. All characteristics are measured with zero common -mode input voltage unless otherwise specified.

□The voltage at either input or common -mode should not be allowed to go negative by more than 0.3 V. The upper end of the common -mode voltage range is V<sub>CC</sub> - 1.5 V, but either or both inputs can go to 30 V without damage.

## Typical Performance Characteristics

( $V_{CC} = 1.5V$ ,  $T_A = +25^\circ C$  (each comparator))

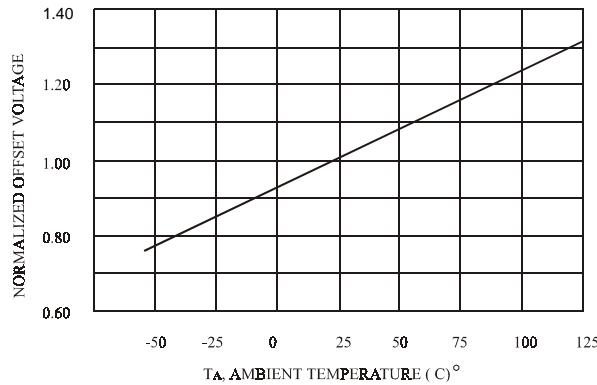


Figure 1. Normalized Input Offset Voltage

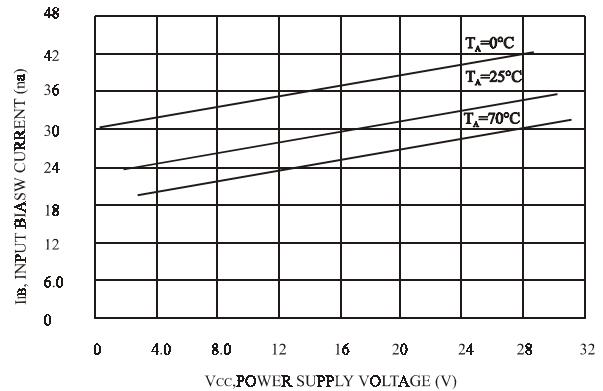


Figure 2. Input Bias Current

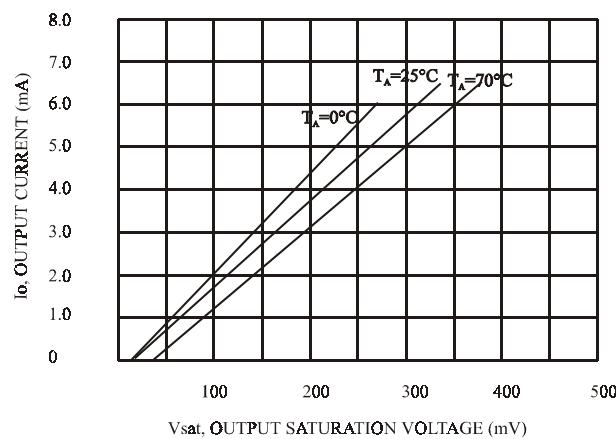
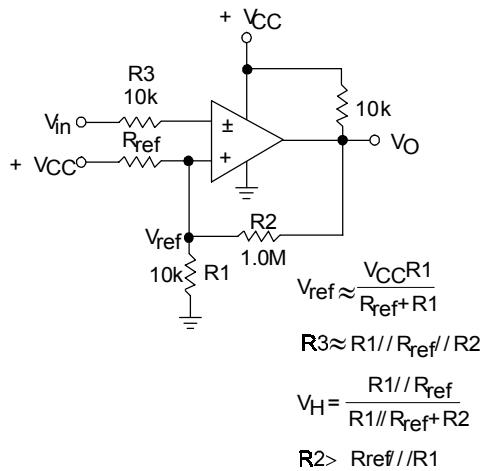
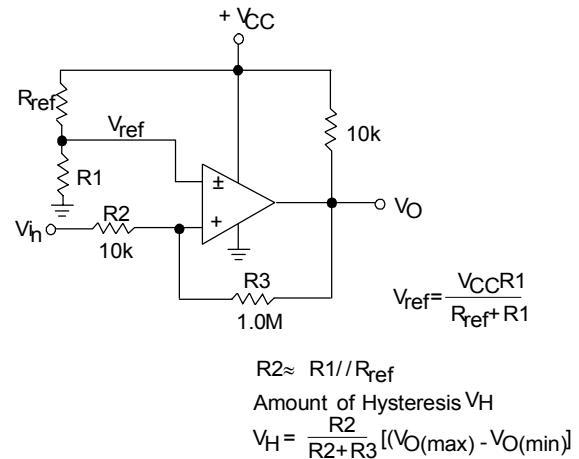


Figure 3. Output Sink Current versus  
Output Saturation Voltage

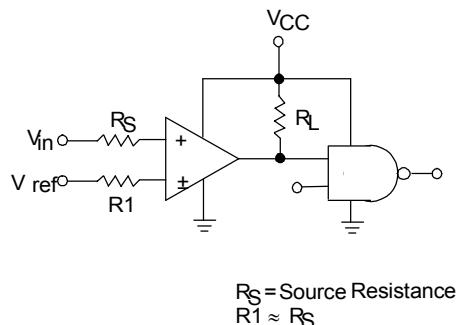
## Typical Applications Circuit



**Figure 1. Inverting Comparator with Hysteresis**

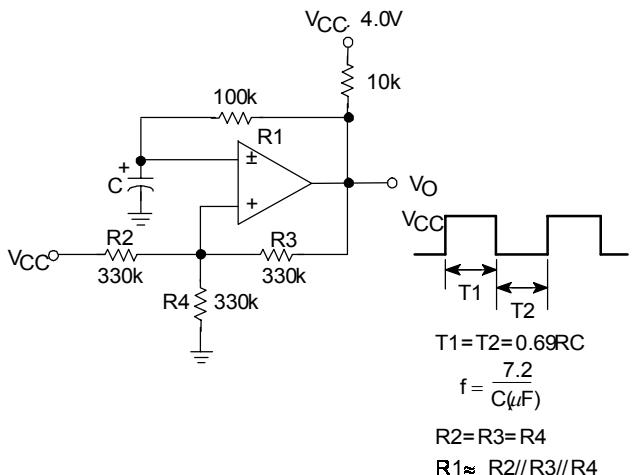


**Figure 2. Noninverting Comparator with Hysteresis**

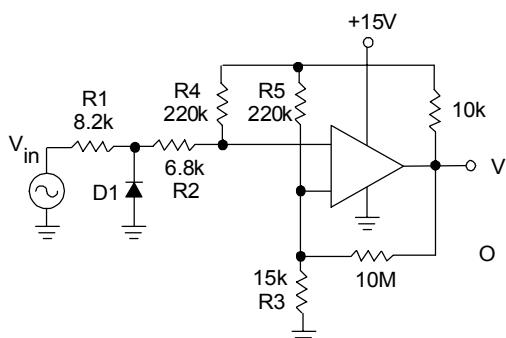


Logic	Device	V <sub>CC</sub> (V)	R <sub>L</sub> kΩ
CMOS	1/4 MC14001	+15	100
TTL	1/4 MC7400	+5.0	10

**Figure 3. Driving Logic**



**Figure 4. Squarewave Oscillator**



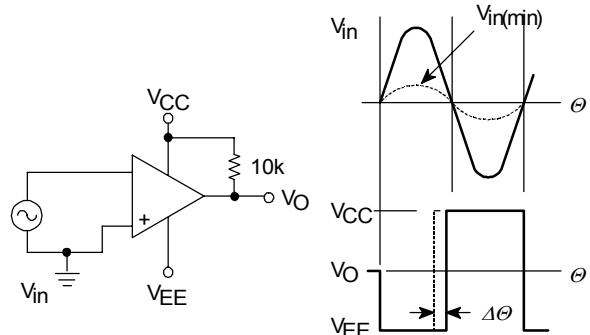
D1 prevents input from going negative by more than 0.6 V

$$R1+R2=R3$$

$$R3,3 \frac{R5}{10} \text{ for small error in zero crossing}$$

**Figure 5. Zero Crossing Detector (Single Supply)**

$V_{in(min)} \approx 0.4V$  Peak for 1% phase distortion ( $\Delta\theta$ ).



**Figure 6. Zero Crossing Detector (Split Supplies)**

## Ordering Information

ORDERING NUMBER	PACKAGE	MARKING
LM339M	SOP-14 / DIP-14	LM339

Address : 北京市海淀区永定路 88 号长银大厦 6A06--6A07

Rm 6A07, Changyin Office Building , No.88, Yong Ding Road, Hai Dian District , Beijing

Postalcode: 100039

Tel: 86-010-58895780 / 81 / 82 / 83 / 84 Fax : 010-58895793

[Http://www.estek.com.cn](http://www.estek.com.cn)

Email: sales@estek.com.cn

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